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(2) THE DEVELOPMENT OF A BEGINNING READING SKILLS PROGRAM USING THE EDISON RESPONSIVE ENVIRONMENTS INSTRUMENT. SECOND PROGRESS REPORT.

(3) ~~BY-~~ GOTKIN, LASSAR G. MCSWEENEY, JOSEPH

(4) NEW YORK UNIV., N.Y., SCH. OF EDUCATION

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THE SECOND PROGRESS REPORT OF A PROJECT UTILIZING A COMPLEX TEACHING MACHINE, THE EDISON RESPONSIVE ENVIRONMENT INSTRUMENT, TO STUDY THE ACQUISITION OF BEGINNING READING SKILLS BY 5-YEAR-OLDS FROM DISADVANTAGED BACKGROUNDS IS PRESENTED. THE FIRST REPORT DESCRIBED THE EDISON RESPONSIVE ENVIRONMENT INSTRUMENT AND DISCUSSED THE PROGRAMING DEVELOPED AS LESSONS IN THE AREA OF VISUAL SKILLS WERE CONSTRUCTED AND TESTED. THIS REPORT IS CONCERNED WITH THE PRE-READING SKILLS OF LABELING EACH OF SEVERAL LETTER SHAPES WITH ONE OF ITS SOUNDS OR NAMES AND OF REMEMBERING THOSE RELATIONS OVER A PERIOD OF TIME. SOME IMPORTANT FACTORS AFFECTING THE CHILD'S ACQUISITION OF THIS SKILL WERE IDENTIFIED, AND PROGRAMING TECHNIQUES WERE IMPROVED. NINE LESSONS WERE WRITTEN TO TEACH NINE LETTER NAMES. SPECIFIC EXAMPLES OF THE PROGRAMING TECHNIQUES EMPLOYED ARE APPENDED. TWO MAJOR LEARNING SETS WERE DISTINGUISHED--AN ATTENTIONAL LEARNING SET AND A RANDOM RESPONSE SET. IT SEEMED POSSIBLE TO ACCOUNT FOR THE PATTERNS OF ALL THE CHILDREN ACCORDING TO THE TYPE OF LEARNING SET EXHIBITED BY EACH CHILD. STATISTICS CONCERNED WITH NUMBERS OF IRRELEVANT RESPONSES, THE PERCENT OF CORRECT RESPONSES, THE TIME REQUIRED FOR LESSON COMPLETION, AND THE KIND AND NUMBER OF LOWER-CASE LETTERS IN EACH LESSON ARE INCLUDED. (RH)

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SECOND PROGRESS REPORT

ON

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Period Covered by Report: January 1, 1966 - April 30, 1966

Title of Project: The Development of a Beginning Reading Skills Program Using the Edison Responsive Environments Instrument

Principal Investigators: - Lassar G. Gotkin, Ed.D.
- Joseph McSweeney, M. A.

Institute for Developmental Studies
School of Education
New York University

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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This Progress Report covers the third four-month period of our use of a complex teaching machine to study the acquisition of beginning reading skills by five-year-olds from disadvantaged backgrounds.

Our first report described our initial experiences and the programming strategies developed as we constructed and tested a sequence of lessons in visual skills. The first report also presented the data from the field test of a visual skills lesson sequence, and, in addition, included a brief description of the instructional features of the equipment, the Edison Responsive Environment instrument.

This report is concerned mainly with the higher order prereading skill of labeling each of several letter shapes with one of its sounds or names, and remembering those relations over a period of time. A number of important factors affecting the child's acquisition of this skill have been identified, leading to improved programming techniques. These factors will be discussed under the general headings of behavioral and motivational strategies.

THE EXPLORATORY LETTER NAME LESSONS

The form of the learning task in the first three lessons required the child first to look at the letter, listen to its letter name, and then press the button bearing the same letter. The stimulus letter remained on the projector while the child heard its name and while he selected the button. These lessons were ineffective in focusing attention on the name as a means of selecting the correct button. Since the letter to be selected was always visible on the projector, the

students simply visually matched the letter on their buttons with the letter on the projector. The name accompanying the presentation was an incidental part of the stimulus which was not used by the child in performing the sound-symbol task. Consequently, when the letter was abruptly withdrawn from the projector stimulus during the third lesson, requiring the child to select the letter button in response to the letter name alone, there was little evidence of correct correspondence. The problem may have been confounded by the number of letters being dealt with, namely five.

A new sequence of three lessons was written using only four letters and a new lesson form which attempted to focus the child's attention on the letter name. This was done by having the child pronounce the name of the letter. The letter was presented for a brief time on the projector, the name was pronounced by the ERE and the child echoed its name. Then the letter was withdrawn from the screen and the child was asked to select the letter-button in response to its name. This technique proved effective in requiring the child to rely more upon the name of the letter, rather than a visual image, as an aid in correct button-selection. The response was not entirely in terms of the letter-name, however, since the child had a recent image of the letter on the screen. Occasionally a flashing presentation of the letter to be named was varied with a non-flashing timed presentation lasting about one second. In both cases, the occurrence of the correct response appeared to be directly related to the recency of the visual presentation of the letter. We reasoned that the only remaining problem was to gradually extend the length of time between the withdrawal of the visual image and the response to its letter name.

THE LETTER-NAME LESSON SEQUENCE: Description of Lesson Format

Having formulated an effective lesson format, nine lessons were written to teach nine letter names. (1) All nine lessons contained three sections: a review section, a motivational strategy section and a criterion section. Lessons were written according to the following model:

Part I: Review

This part of the lesson reviewed letters previously taught. Typically, the child saw a flashing image of the letter. This image was withdrawn, and he then heard the name of the letter which was just flashed, and pressed the letter-button associated with that name.

1. flashing letter immediately followed by
2. letter name, followed by
3. child's button press

Part II: Motivational Strategies

This part employed the same letters as Part I, but the context in which the child saw the letter was constructed employing pictures which, it was felt, would motivationally appeal to young children. As an example, the child heard the letter name a, pressed a, and saw either: (1) a little girl sliding down an oversized a, or (2) a snake forming himself into the shape of the letter a, or (3) a crow flying away with the letter a in its beak. These are brief instances from story-like sequences. The functional aspect of the lesson, i.e., the underlying behavior of selecting a letter in response to its name, was essentially the same as in the Review section of the lesson. The difference lay in the context in which this learning took place.

(1) Analysis of the structure of each lesson, as well as the entire sequence, is shown in Tables 1,2,and 3. In addition appendix I provides specific examples of the programming techniques employed.

Part III: Criterion

The function of this portion of the lesson was to determine if the child had learned the lesson content and was ready for new material. This section had a minimally motivating context similar to that of the Review section. The letter name was presented without the aid of visual cues and the child was required to press the corresponding letter-button.

1. letter name followed by
2. required button press

FIELD TEST RESULTS FOR THE LETTER-NAME LESSON SEQUENCE

Results of the field test for nine letter-name lessons include the degree of improvement between pre- and posttests, the amount of time required to complete each lesson, and the level of correct responding during the Criterion section of each lesson. The pre-and posttest required the child both to point to a letter when an adult named the letter, and to name the letter himself. While each of the eight children employed in this field test was tested for knowledge of the entire alphabet (both upper and lower case), the pre-and posttests referred to here included only the nine letters taught by the lesson sequence.

Improvement from pre- to posttest is shown in Table 4. Pretest knowledge of the letters being taught was practically zero; however, the mean posttest score for all children was about 45%, a substantial improvement, particularly in comparison with the low pretest scores.

Table 5 indicates the time required to complete each lesson in comparison with the minimum time required for an adult to complete each lesson. It should be noted that approximately 1-1/2

hours of instructional time was required by each child to complete the nine-lesson sequence, approximately a quarter-hour longer than the minimum time required by an adult. Table 6 provides a further analysis of the actual time required by the children and the minimum time required for an adult to complete each lesson. Of particular interest are the inefficiency ratios, which permit the comparison of lessons differing in length. The inefficiency ratios indicate that the nine lessons differed considerably in the amount of excess time spent. While reasons for these differences can not as yet be completely documented, it is thought that the excess time in general is related both to the occurence of irrelevant responses and to the occurrence of errors. Further study is needed to determine how lesson length, the use of various motivational strategies, and lesson difficulty interact to affect the child's performance. A future analysis will, it is hoped, be able to compare the efficiency of lessons (the proportion of excess time required for completion), with the effectiveness of lessons (what is learned).

Table 7 indicates the performance levels for the Criterion sections of individual lessons. Initial performance in the first lesson was high, (70% or above), for students 1,2,4,6,8 and low (40% or below) for students 3,5, and 7. In general, a student's level of correct responding was high for lesson one, it tended to decrease in subsequent lessons when additional letters were introduced. If achievement was low for lesson one, it tended to remain low throughout the sequence.

DISCUSSION AND GENERAL OBSERVATIONS

It seemed possible again to account for patterns of all children according to the type of learning set exhibited by the child. Two major learning sets were distinguishable:

(1) an attentional learning set

(2) a random response set

However, it was rare that a child employed the same response set throughout a lesson, and most seemed to make use of both patterns,with varying emphasis. (A description and discussion of these two types of response sets has been included in the previous progress report for this project.) The choice of response sets seemed to be determined by the amount and kind of corrective information available.

Each wrong button response was immediately followed by a resistance against the child's finger. This resistance caused by the locked key can be thought of as informing the child that his button selection was wrong. At this critical juncture, the children usually exhibited one of two behaviors: (1) a content response, in which the children thoughtfully revised their selection by visually scanning the keyboard or (2) a motor response, in which the children manually searched for one key which was "open", i.e., could be depressed. The content response is consonant with an attentional learning set, while the motor response is more characteristic of a random response set. Our conclusions were that the chief value of the locked key board was a negative one (informing the child that the locked key was not the correct one) and consequently, this information alone was insufficient in aiding him to select the correct key.

Another factor affecting performance over the lesson sequence was the increasing difficulty of the lessons. Adding a new letter to the keyboard with each succeeding lesson, or every other lesson, increased the amount of information which the child was required to process and to remember and probably contributed to the general decline in performance over the series of lessons.

With progress through the lessons, the content response was replaced in whole or part by the motor response, which tended to reflect the characteristics of random selection. The factors thought to be critical in accounting for this shift in response set were the interacting effects of available corrective information, the pace of lesson tasks, and the amount of information which the child was required to process.

With regard to the amount of information processed, one general finding concerned the effects of introducing new letters on performance with letters presented in previous lessons. Review and practice of previously taught letters was insufficient for maintaining performance with these letters, when additional letters were introduced.

In order to determine the extent to which different types of corrective information affected performance, two new programming strategies were tried out in several of the lessons. Positive results were obtained which seemed to support the conclusion that performance would improve with better corrective information.

The first strategy essentially consisted of differentiating the button-pressing response into two distinct sections, with a pointing response preceding the usual pressing response. The procedure was

as follows; the child was asked to "point to the letter named "a". This was followed by a flashing image of "a", and then a request to "press a". This format permitted the child to correct or confirm his pointing response before being asked to press the letter.

The second programming strategy consisted of associating a mnemonic with two of the letters taught,"o" and "s". The letter "o" was referred to as the "round letter", and the letter "s" was referred to as the "snake letter". Observation indicated that the children did make use of these mnemonics in revising their button selections; the mnemonics helped the child to avoid random errors by directing the child's attention to the structure of the letter.

From Figure 1, it is evident that the amount of irrelevant behavior changes as each lesson moves from the review or introduction to the more interesting game, story and picture strategies. With regard to the relationship between the amount of irrelevant behavior and time required to complete the lesson, the Motivational section generally required either the same or more time to complete (except lesson no. 4), in relation to the Review section. The latter, along with the Criterion section, contained no motivational strategies as defined here, but simply displayed information in a minimal form. In comparing the Review and Motivational sections, more irrelevant responding is reflected in the Review portion of each lesson, than in the Motivational portion, despite the shorter length of time required to process the Review. Thus, although the Motivational section required more time to process, there were generally fewer instances of irrelevant behavior. Our qualitative impression from observing each child in these lessons strongly supports this numerical data. Each child, with few exceptions, seemed more intently absorbed in listening, watching and responding to the motivational strategies than was evident during other

portions.

The higher occurrence of irrelevant behavior in the Review portion, especially during later lessons, cannot be entirely attributed to the absence of motivating strategies. The Review responses were more abstract, and did not employ the flashing images or mnemonics which would have considerably aided the child in making correct responses. Moreover, each response in the Review section was required at a much faster rate than those required in the Motivational portion where many responses were separated by a 10 second dialogue which considerably reduced the demand for fast accuracy. In addition to slowing down the rate of response, the dialogues appeared to involve the child more intensely in the events of the lesson. The value of these motivational strategies in contributing to higher achievement cannot yet be fully assessed. However,on the basis of both the numerical data presented (see Figure 1) and general observations, our conclusion has been that motivational strategies are valuable in achieving an attentional response set in the child. However, they were not completely successful in eliminating random responding. In summary, the motivational strategies seemed to affect the child's looking and listening behavior, but <u>not</u> his button-selection behavior. While the children could be observed intently watching and listening to the stimulus, this was often followed by random responding.

It is unlikely that additional use of motivational strategies can reduce random responding. Further improvement in providing corrective information is necessary in order to capitalize on a primary source of motivation -- the child's realization of his own competence.

OTHER ACTIVITIES

Two papers have been completed. The first, The Machine and the Child by L. Gotkin, was published in the Summer 1966 issue of Audio Visual Communications Review. An extended version of that paper with Joseph McSweeney as co-author will appear as a Chapter in the 1966 NSSE Year Book devoted to Programmed Instruction and Teaching Machines.

Presentations by Gotkin, McSweeney, and Richardson constituted a symposium at the April Meetings of the National Society for Programmed Instruction. A rough version of a film showing children going through a sequence of our lessons on the ERE machine constituted a portion of our presentation. This film has been used as the basis of seminars held by several researchers in different parts of the country.

During this past year the project staff ran a weekly demonstration seminar. Our next progress report will include a detailed analysis of attendance. On the average more than 25 reading specialists, psychologists, teachers, researchers, college professors, and others visited our project each month. This was accomplished in a single two hour session each week. We have decided to hold demonstration seminars on alternate weeks to reduce diversions in our laboratory setting. It is hoped that our film will prove a suitable substitute for actual visits to the laboratory.

TABLE I

NUMBER OF BUTTON-PRESSING RESPONSES REQUIRED IN THE REVIEW, STRATEGY AND CRITERION PORTIONS OF EACH LESSON

Lesson No.	1	2	3	4	5	6	7	8	9
Review	18	25	18	24	30	7	20	17	35
Strategy	36	7	9	7	10	14	13	5	13
Criterion	10	6	10	8	5	14	18	5	20
Total	64	38	37	39	45	35	51	27	68

TABLE 2

MINIMUM TIME IN MINUTES REQUIRED TO COMPLETE THE REVIEW, STRATEGY AND CRITERION PORTIONS OF EACH LESSON

Lesson No.	1	2	3	4	5	6	7	8	9
Review	4	3	5	3	3	2	2	2	3
Strategy	5	3	3	4	3	4	5	3	4
Criterion	1	1	1	1	2	1	1	2	2
Total	10	7	9	8	8	7	8	7	9

TABLE 3

KIND AND NUMBER OF LOWER-CASE LETTERS IN EACH LESSON

Lesson No.

1	2	3	4	5	6	7	8	9
n	n	n	n	n	n	n	n	n
o	o	o	o	o	o	o	o	o
s	s	s	s	s	s	s	s	s
	a	a	a	a	a	a	a	a
			c	c	c	c	c	c
				e	e	e	e	e
					t	t	t	t
						h	h	h
								i

TABLE 4

PERCENTAGE OF CORRECT RESPONSES FOR NINE-ITEM LETTER-NAMING PRE - AND POST TEST

Student #	Pre-test	Post Test	Gain
1	11	55	44
2	11	47	36
3	0	11	11
4	0	77	77
5	0	6	6
6	0	69	69
7	0	33	33
8	0	64	64
Mean	2.75	45.25	42.50

TABLE 5

COMPARISON OF MINIMUM TIME AND ACTUAL TIME REQUIRED TO COMPLETE LESSONS

	Lesson No.									Total	Mean
Student No.	1	2	3	4	5	6	7	8	9		
1	10	7	10	8	9	9	8	7	12	80	8.9
2	11	7	11	8	10	10	11	8	14	90	10.0
3	14	11	12	9	12	10	11	10	12	101	11.2
4	12	8	16	9	13	8	9	8	11	94	10.4
5	13	8	15	9	15	14	14	8	12	108	12.0
6	11	8	9	10	10	9	12	8	11	88	9.8
7	10	9	19	8	11	10	12	9	13	101	11.2
8	11	8	11	10	10	9	12	8	12	91	10.1
Total	92	66	103	71	90	79	89	66	97		
Mean	11.5	8.3	12.9	8.9	11.3	9.9	11.1	8.3	12.1		
Minimum Time Required	10	7	9	8	8	7	8	7	9		

TABLE 6

TIME REQUIRED FOR LESSON COMPLETION IN EXCESS OF MINIMUM TIME REQUIRED [1]

	Lesson No. 1	2	3	4	5	6	7	8	9	Total	Average Excess time for each Student in Minutes
Minimum Lesson Time in Minutes	10	7	9	8	8	7	8	7	9	73	
# Minutes in Excess of minimum for each subject											
Subject 1	0	0	1	0	1	2	0	0	3	7	0.8
2	1	0	2	0	2	3	3	1	5	17	1.9
3	4	4	3	1	4	3	3	3	3	28	3.1
4	2	1	7	1	5	1	1	1	2	21	2.3
5	3	1	6	1	7	7	6	1	3	35	3.9
6	1	1	0	2	2	2	4	1	2	15	1.7
7	0	2	10	0	3	3	4	2	4	28	3.1
8	1	1	2	2	2	2	4	1	3	18	2.0
Total	12	10	31	7	26	23	25	10	25	169	
Average Excess Time for each Lesson in Min.	1.5	1.3	3.9	0.9	3.3	2.9	3.1	1.3	3.1		
Inefficiency Ratio [2]	15%	18%	43%	11%	41%	41%	39%	18%	35%	29%	

[1] These figures were obtained by subtracting the minimum time per lesson from the actual time required by each subject.

[2] The inefficiency ratios were obtained by dividing the average excess time by the minimum time required for each lesson, thus making lessons of different lengths more easily comparable.

TABLE 7

PERCENT CORRECT BUTTON-PRESSES DURING CRITERION PORTION OF EACH LESSON

Student No.	1	2	3	4	5	6	7	8	9	Mean
1	80	50	80	38	40	78	63	100	35	63
2	80	33	50	25	40	21	44	60	30	43
3	20	33	20	25	20	14	15	20	5	19
4	90	100	100	25	60	100	56	100	60	77
5	40	33	40	13	40	7	11	40	25	28
6	90	67	40	50	40	50	39	60	35	50
7	40	17	80	50	60	43	33	100	40	51
8	100	33	80	50	68	71	61	80	65	68
Mean	65	33	61	34	46	48	40	100	37	

TABLE 8

NUMBER OF IRREVELANT RESPONSES DURING REVIEW PORTION OF EACH LESSON

Student No.	Lesson No. 1	2	3	4	5	6	7	8	9	Total	Mean
1	0	0	2	3	1	15	5	0	20	46	5.1
2	0	2	5	2	15	10	8	1	7	50	5.6
3	10	19	33	11	21	10	1	0	1	106	1.1
4	16	6	18	17	30	3	2	4	9	105	11.7
5	1	0	4	0	2	3	1	0	12	23	2.6
6	0	3	11	26	13	13	7	4	3	80	8.9
7	0	0	0	1	0	0	1	0	14	16	1.8
8	4	0	5	6	0	0	7	3	6	31	3.4
Total	31	30	78	66	82	54	32	12	72		
Mean	3.9	3.8	9.9	8.3	10.3	6.8	4.0	1.5	9.0		

TABLE 9

NUMBER OF IRRELEVANT RESPONSES DURING THE STRATEGY PORTION OF EACH LESSON

Student No.	Lesson No. 1	2	3	4	5	6	7	8	9	Total	Mean
1	0	2	0	0	4	12	1	3	6	28	3.1
2	0	0	0	0	10	0	5	4	12	31	3.4
3	27	6	1	6	18	23	2	2	0	85	9.4
4	7	4	1	0	3	3	0	14	0	32	3.5
5	7	1	0	0	1	0	1	0	0	10	1.1
6	0	1	0	0	0	0	0	2	3	6	0.7
7	0	0	0	0	2	1	16	0	6	25	2.8
8	1	0	0	0	0	1	0	11	2	15	1.6
Total	42	14	2	6	38	40	25	36	29		
Mean	5.3	1.8	0.3	0.8	4.8	5.0	3.1	4.5	3.6		

TABLE 10

NUMBER OF IRRELEVANT RESPONSES DURING CRITERION PORTION OF EACH LESSON

Student No.	Lesson No. 1	2	3	4	5	6	7	8	9	Total	Mean
1	0	1	1	0	13	4	0	0	6	25	2.8
2	0	7	0	4	5	9	0	1	17	43	4.8
3	7	1	4	6	4	2	0	0	0	24	2.7
4	5	3	0	6	4	0	0	0	0	18	2.0
5	1	0	0	0	2	0	12	0	0	15	1.6
6	0	1	0	0	0	0	0	1	0	2	.2
7	0	0	0	0	3	4	1	1	1	10	1.1
8	0	2	0	0	0	2	2	4	3	13	1.4
Total	13	15	5	16	31	21	15	7	27		
Mean	1.6	1.9	0.6	2.0	3.9	2.6	1.9	0.9	3.4		

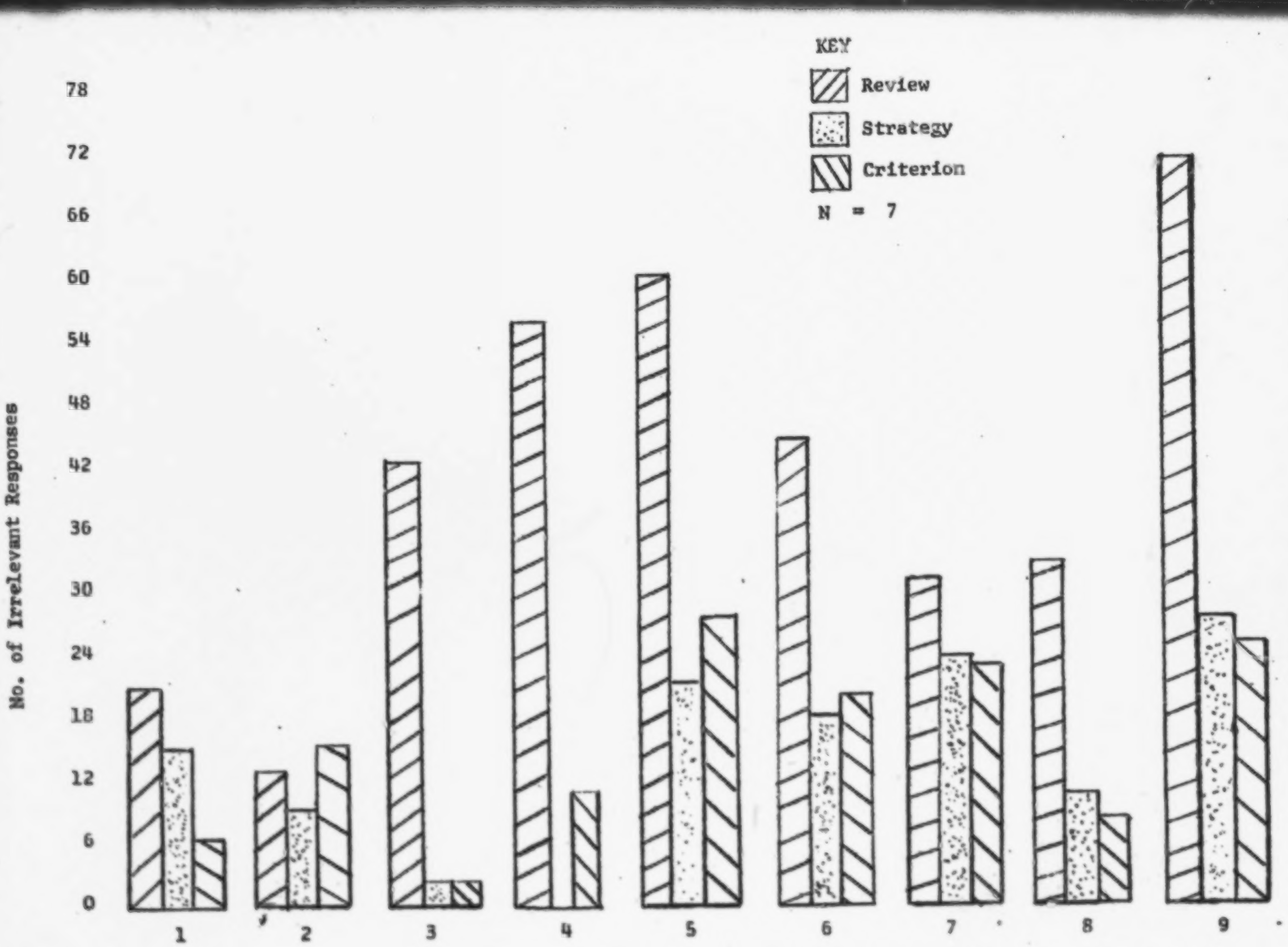

Fig. 1 Total amount of irrelevant responses in the Review, Strategy, and Criterion portion of each lesson.

APPENDIX I

Miniature examples revealing lesson structures.

Lesson No. 1

Review Section

1) Flashing letters - Child sees letter flashing and is directed to say the letter name each time the letter flashes, and then press it, when projector is off.

   The stimuli are n, o, n, o, s, n, o, s, n, o

2) Say and Press -- Child hears letter name and is directed to say the name of letter and press button.

   Stimulus series: s, n, o, n, o, s, o, n

Stretegy Section

Child matches color, presses color button, color is withdrawn and the child hears a letter name and presses the letter button.

Stimulus series - red, n, yellow, o, red, n, dots, s, dots, s, red, n, yellow, o, yellow, o

3) Letter a is introduced and child is taught to respond to a with color button technique.

   Stimulus series - a, a, blue, a, dots, s, blue, a, red, n, yellow, o, dots, s, blue, a, red, n, dots, s, blue, a, yellow, o

Criterion Section - Child hears letter name and presses button.

Stimulus Series - o, s, o, n, a, o, n, s, a, o

Lesson 2

Review Section - Flashes picture of letter only the first time a response is required to that letter.

Stimulus Series -- n, n, a, a, n, a, n, s, s, a, s, n, a, s

o, o, s, o, n, o, a, s, o, n, o.

Strategy Section

1) Introduces new letter (c) - Child sees picture of crow with letter a, is asked to say letter name, picture is withdrawn and child is asked to press a.

2) Multiple choice -

1. Child sees picture of crow with 3 letters - n, a, s, -

Child presses n and sees n on horse's back.

Child presses a and sees a on horse.

Child presses s and sees s with a seal.

2. Child sees seal with 3 letters - son -

Child presses s and sees s on a truck.

Child presses n and sees n on truck.

Child presses a and sees a on top of a bus.

Criterion Section

Child hears letter name, presses letter and sees picture of letter and animal/or vehicle flashing

Stimulus series - n, a, o, s, n, a

Lesson 3

Review Section - Flashes pictures of letter only the first time a response is required

Stimulus series - n, n, a, n, a, s, a, s, n, o, o, s, a, o, s, n, s, o

Strategy Section - Child is told he is going sailing with Sailor Sam. Sam's voice comes on and directs child to press letters to see pictures of the ship, fish, etc.

Suddenly child is told there is a storm and to send a message s.o.s.

Child is told storm is over and Sailor Sam says goodbye.

Stimulus Series n, a, o, s, o, s, s, o, s

Criterion Section - Child hears letter name and presses letter button.

Stimulus Series - s, o, n, a, c, c, a, n, o, s

Lesson 4

Review Section - Flashes picture of letter only the first time a response is required to that letter.

Stimulus Series - a, a, n, n, a, n, s, s, a, n, s, o, o, s,

a, c, n, c, c, o, n, s, c, a

Strategy - Child sees cartoon picture of snake doing tricks.

1) Child presses button, sees snake make letter -- o, n,

2) Snake fails to make letters, child helps by pressing button and sees snake formed into s.

Procedure repeated for letter c.

Criterion Section - Child presses button and sees snake make letter.

Stimulus Series - c, o, n, c, c, a, c, s

Lesson 5

Review Section - Child hears letter name and presses button.

Child sees letter flashing only first time response is required

Stimulus Series - e, e, n, n, e, n, e, s, s, n, e, s, e,

o, o, a, a, o, e, n, o, a, c, c, o, e, a, s, e, n

Strategy Section -

Child sees picture of tree with apples.

Child presses a and the apples change to a's on the tree.

This procedure is repeated for each letter. Child sees tree with objects (cats, toys, snakes).

The objects in tree turn to letters when child presses letter button in response to name.

Stimulus sequence - c, a, o, s, n, c, s, e, c, o

Criterion Section - Child hears letter name, presses letter button, and a picture of the tree with objects is flashed.

Stimulus sequence - e, t, o, n, c, s.

Lesson 6.

Review Section - Child sees letter flash. He is requested to say the name of the letter when he sees it flash. Child hears name and presses button. Every button response is cued with a flash.

Stimulus Series - t, s, e, o, c, n, a.

Strategy Section - Child sees Christmas tree with all 7 letters under it; is told to trim the tree by pressing the buttons. The child hears a song directing him to press the letters. Each time he presses a letter, the picture is changed placing that letter on the tree. Then the procedure is reversed, removing the letters from the tree.

Stimulus Series - c, o, s, n, t, a, e, e, a, t, n, s, o, c.

Criterion Section - Child hears letter name and presses button (no visual cueing.)

Stimulus Series - n, a, s, c, o, e, t, s, o, t, e, a, n, c.

Each letter is pressed twice.

Lesson 7.

Review Section - Flashing picture of letter only the first time a response is required.

Stimulus Series - h, h, h, s, n, h, s, n, c, h, s, n, c, o, s, h, c, b, h, o,

Strategy Section - Child sees little girl playing with letters larger than she is. Child hears little girl talking to him deciding what to do with the letters. Child presses the letter and sees the little girl playing with the letters. (Sliding down a, swinging from t, etc.).

Criterion Section - Child hears letter name and presses letter button.

Stimulus Series - h, a, h, t, s, o, e, h, n, c, o, t, s, h, e, h, a, c.

Lesson 8.

Review Section - Child hears letter name and presses letter button.

Stimulus Series - h, o, h, t, o, c, o, h, e, t, h, c, o, e, t, c, e, c, h

Strategy Section - Child is taught to press a button with a face.

After pressing face button child hears another child's voice directing him to pick up one of several rings and put around a certain letter. He is given visual feedback. In this way the child is directed to place rings around h, e, o, e, and c.

Criterion Section - Child is directed to take rings off letters one at a time - no feedback is provided.

Stimulus series - h, t, o, e, c.

Lesson 9.

Review Section

Child hears name and presses button. On first response required for each letter, the child is asked to point to the letter and then is shown a flashing picture of the letter.

Stimulus sequence - i, i, h, i, h, s, h, i, s, i, n

i, s, n, h, i, c, i, n, s, c, h, i, n, s, h, c, i

c, h, o, s, c, n, s.

Strategy Section - Same as Lesson 7.

Criterion Section - Child is asked to listen to letter name, clap his hands, and then press the button.

Stimulus Series - i, h, a, s, i, n, c, h, o, t, s, e, i,

a, c, n, h, e, o, i

Staff Summary:

The following named persons constitute the project staff paid in full or part directly from project funds:

L. Gotkin

J. McSweeney

E. Richardson

F. Caudle

M. Goldman

Other persons contributing to the project who are paid from other fundings:

F. Boulware

A. Covert

C. Kelly

J. Johnson

B. Hinds

A. Gebo

N. Tictin